contraband (e.g., explosives, drugs, etc.). While the imaging system 10 will be described in the context of radiography, it should be understood the concepts described herein are also intended to cover computed tomography and laminography.

[0013] While the imaging system 10 will be described in the context of truck inspection, it should be understood that the system 10 may also be used for the non-invasive inspection of many other things. For example, the features of the system 10 that are described below also allow the system 10 to be easily used for the inspection of automobiles, railcars, barges, shipping containers or even luggage.

[0014] As the radiation of the X-ray beam 18 passes through the truck, the contents of the truck attenuate the beam based upon the density of the truck's contents. The attenuated X-ray beams may then be measured and used to form an image of the content of the truck 16.

[0015] One difficulty with prior art truck inspection systems is that trucks typically carry loads with a wide variety of densities. For example one truck may be carrying ping-pong balls whereas another truck may be a tanker carrying water or fuel. However, in either case, the truck carrying ping-pong balls, water or fuel could also be carrying explosives or other contraband. Because of this possibility, a vehicle imaging system must be capable of working equally well with ping-pong balls as with water.

[0016] Also, in any given truck, some of the X-ray beams may pass through air or through only very thin walls of the truck's trailer, which have negligible attenuation and the detected signals are very high, while other X-ray beams may

X-ray systems, it would be expected that the source and detector would scan in the vertical as well as the horizontal direction in order to form images of the entire volume of the truck 16.

[0023] Turning now to the imaging system 10 in specific, FIG. 3 is a block diagram that shows additional details of the imaging system 10. As shown, a processor 22 may be provided for purposes of controlling the system 10. A man-machine interface (MMI) (e.g., a keyboard) 24 may be provided for entry of commands or operating parameters into the processor 22. A display 26 may be provided for image display.

[0024] Each detector element 20 may include a scintillating element 28 and a pair of associated photodetectors 30, 32. The scintillating elements 28 may be of an appropriate material (e.g., a single crystal, polycrystalline, ceramic, plastic, etc.) with a depth appropriate for the energy level of the source 12 (e.g., 6 MV).

[0025] Each scintillating element 28 functions to convert impinging X-rays (i.e., an X-ray beam) into visible or near-visible light. For convenience, the visible or near-visible light will be referred to as the converted X-ray beam. The converted X-ray beam may then be detected within the pair of detectors 30, 32.

[0026] The pair of photodetectors 30, 32 may be coupled to an associated amplifier 34, 36 and function to collect substantially identical samples of the same X-ray beam. Under one illustrated embodiment, a first amplifier 34 of each detector element 20 provides a first gain value, K1, and the second amplifier 36 provides a second gain value, K2. Under the embodiment, the gain of the first amplifier

array 14 is moveable) and from the longitudinal information provided by the position sensor 50.

[0033] The first image 52 may be limited to samples from the low-gain amplifiers 36 and the second image 54 may be limited to corresponding samples from the high gain amplifiers 34. Each set of images 52, 54 may be formed from a single imaging location of the truck showing the same view (albeit with different levels of amplification).

[0034] Alternatively, samples from the low and high-gain amplifiers 34, 36 may be integrated into the same image based upon a color-coding arrangement. For example, pixels that display samples from the low-gain amplifiers 36 may be displayed as a gray-scale image where intensity of the detected X-rays is indicated by the brightness of the pixel. In contrast, pixels that display samples from the high-gain amplifiers 34 may be displayed with a blue background where intensity is again indicated by color intensity.

[0035] To select the appropriate sample, the processor 38 may compare each sample from the amplifiers 34, 36 of each detector element 20 with a set of threshold values. An upper threshold for the high-gain amplifiers 34 may be set at a saturation value for that amplifier. When the processor 40 detects saturation of the high-gain amplifier, the processor 40 may simply substitute a value from the low-gain amplifier in the appropriate pixel position along with a gain indicator (gray-scale brightness) indicating the amplification level. Alternatively, a single grey-scale image can be formed by normalizing the values from the high and low-gain amplifiers. The values may be normalized against a predetermined pixel display range by a normalizing processor 56 using a suitable algorithm to